

## REMARKS

### Amendments to the Claims

Claims 1 and 3 are herein amended and claim 2 is cancelled. Claim 11 was previously cancelled. Claim 1 is amended to rearrange the order of the membrane layers to claim the middle layer before the barrier layer, for reasons of logic. Claim 1 is also amended to include the limitations for the composition of the middle layer from claim 2, now cancelled, and to add limitations for the composition of the barrier layer found in original claim 13. Finally, claim 1 is amended to include the original listing of polymer particle additives, as detailed in original claim 6 (cancelled in the previous response). Claim 3 is amended to further limit the composition of the middle layer to an adhesive. Support for this amendment is found in original claim 2, and throughout the specification.

### Rejections under 35 USC 112, para. 1 – Written Description/New Matter

Applicant has amended claim 1 to delete the term “covalently” and has listed the limitations for the polymeric particles, originally described in claim 4, in claim 1 as originally presented. Therefore, Applicant respectfully submits that claims 1 and 4 do not contain new matter and so requests withdrawal of the new matter rejection and reconsideration.

### 35 USC § 102(b) Rejections – Anticipation

The Examiner has maintained the rejections of claims 1-9 and 12 under 35 U.S.C. 102 (b) as being anticipated by Mahendran et al (US 5,914,039) (hereinafter ‘039). As amended, claim 1 requires that the middle layer is selected from the group consisting of, “an epoxy, a polyurethane, a silicone, an adhesive, a monomer, a polymer, and a combination thereof” and the barrier layer now recites that the barrier layer consists of “of 8-55% by weight of at least one hydrophobic polymer and 1-50% by weight of at least one hydrophilic polymers, 1-50% by weight of at least one polymer particle as an

additive, 1-30% by weight of other organic and inorganic additives, and the remaining % by weight solvent, wherein the at least one polymeric particle has a particle size from 0.2 nm to 500  $\mu$ m, and is selected from the group consisting of cross-linked polyvinylpyrrolidone, poly(acrylonitrile-co-methacrylonitrile), crosslinked polystyrene, polyethylene, polypropylene, crosslinked sulfonated polystyrene, crosslinked poly(4-trimethylamino chloride styrene), crosslinked polyethylenimine, crosslinked poly(4-vinylpyridine), poly(4-vinylpyridine) cross-linked, methyl chloride quaternary salt, crosslinked cellulose acetate, crosslinked anion exchange resin, cation exchange resin, crosslinked sulfonated polysulfone and polyethersulfones and combinations thereof’.

Applicant respectfully submits that the ‘039 patent does not disclose a membrane having three layers; namely, a support layer, a middle layer consisting of the recited compositions, and a barrier layer that consists of the recited compositions and in fact, does not disclose a distinguishable middle layer at all (see col. 3, lines 52 – 64, “...extruding *the* dope on to the support at a rate sufficient to form *a continuous layer* of dope...”, emphasis added). Note the reference in ‘039 to a single doping material added directly to the support layer (braid) to form a *single continuous* layer on the braid support. The dope is not added to an adhesive, or other layer already present on the support layer. In the ‘039 patent, the single continuous layer of dope is added directly to the support layer and forms a single continuous layer covering the support - there is no distinct middle layer.

Applicant therefore respectfully submits that claim 1, and all claims which depend therefrom, are novel over the cited prior art. Reconsideration of the claims and withdrawal of the anticipation rejection under 35 USC § 102(b) are therefore requested. In addition, the ‘039 patent does not teach crosslinked polymeric particles.

#### 35 USC § 103(a) Rejections – Obviousness

Claim 10 stands rejected for obviousness based on the ‘039 patent combined with patent ‘473. Given that the ‘039 patent, the base reference of the obviousness rejection by the Examiner does not disclose all the elements of the presently claimed membrane (see above), the combinations of ‘039 with Strobel (US 5,766,473 – hereinafter the ‘473

patent) to reject claim 10 and '039 with Cooper (US 3,676,193 – hereinafter the '193 patent) to reject claims 2 (now cancelled, but the limitations have been added to claim 1) and 3 likewise do not teach all the elements of the membrane of claim 1 in the instant application.

Moreover, there is no suggestion in the references themselves, or the knowledge available in the art for the '039/'473 combination. Combining patent '473, which discloses "a supporting structure having a complex geometric configuration and an extremely thin hydrophilic polymer shell" (col. 4, lines 7-10), with patent '039 renders the '039 patent unsatisfactory for its intended purpose. According to MPEP § 2143.01(V) "If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)." Patent '039 states that "The novel membrane provides about 50% higher specific flux than a membrane made with the same polymer but without the  $\alpha$ -Al particles. Unexpectedly, the net flux is improved by treating the membrane with a solution of sodium hypochlorite..." (see Abstract) and "It is critical that the particles be  $\alpha$ -Al which are basic (pH in the range from about 8 to 10) and that they be added prior to grafting ..." (col. 2, line 67 - col. 3, line 2). There is no suggestion in patent '039 or the knowledge in the art to modify the critical aspect of the particles to be a particle other than " $\alpha$ -AL particles which are basic."

Because the support structures disclosed in the '473 patent are not membranes, there is no requirement for flux, let alone unexpectedly improved net flux through the polymeric shell of the '473 patent. Because of the criticality of the  $\alpha$ -Al particles in the '039 patent, one skilled in the art would not interchange the '039 continuous layer of polyvinylidene fluoride (PVDF) interspersed with  $\alpha$ -Al particles and then grafted with a *hydrophilic* polymer to form a copolymer, with the tactic polymeric shell of the '473 patent, uniquely suited for coating the complex geometric configuration of the '473 support structure, for fear of losing the unexpectedly improved net flux provided by the unique polymeric copolymer of the '039 patent. Even more, because of the criticality of  $\alpha$ -Al particles in the '039 patent, one skilled in the art would not interchange these

critical particles with a different particle, particularly one that does not include aluminum, as in the instantly claimed invention. Whether the shape of the membrane is a sphere or other shape, the combination of '039 and '473 is not suggested or taught, and does not teach all the elements present in the instant claims. Thus, Applicant respectfully submits that there is no suggestion to make the '039/'473 combination.

Claims 2 (cancelled) and 3 stand rejected for reasons of obviousness based on the '039 patent and patent '193. Patent '193 teaches only a single layer on the support layer, wherein the single layer impregnates the support material (see col. 3, lines 44-51; claims 1, 8 and 21), not two layers coated on the support layer. In the membrane of instant claim 1, there are three layers total (the support, the middle layer, and the barrier layer) and the polymer particles in the barrier layer are crosslinked. Thus, as stated above for the § 103(a) rejection of claim 7, the '039/'193 combination does not teach all the elements of claims 2 and 3.

And as detailed above, combining patent '193 with the '039 patent renders the '039 patent unsatisfactory for its intended purpose, because again, the unexpectedly improved net flux seen with the unique copolymer dispersed with the critical  $\alpha$ -Al particles disclosed in the '039 patent would be lost with such a combination. Even with the improved flux the '039 patent discloses a flux of only 50 gfd/psi (col. 12, line 2), in contrast to the flux of as high as 500 gfd/psi claimed in the presently claimed invention. Thus, the best flux disclosed in the '039 patent is about 10 times worse than that of the presently claimed invention.

Moreover, the film layer in patent '193 impregnates the support layer, whereas in patent '039, the copolymeric dope is applied to the support layer by "extruding the dope *on* to the support" (col. 3, lines 59-60, emphasis added) not *into* the support.

Thus, there is no motivation to combine the '039 patent with the '193 patent, or to modify the '039 patent and/or '193 patent as would be needed to arrive at the presently claimed invention.

Because the combinations cited by the Examiner fail to teach or suggest all the elements of the claimed membrane in instant claim 1, and because there is no motivation or suggestion to make the cited combination, or modify the cited art, Applicant

respectfully submits that there is no *prima facie* case of obviousness and the claims are patentable over the cited combinations.

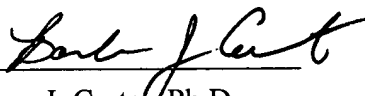
#### CONCLUSION

Applicant respectfully submits that all pending claims are in condition for allowance. Reconsideration of the claims and a notice of allowance are therefore requested. Applicant believes that no extension of time is required for this matter, but hereby submits this conditional petition for an extension of time, if needed, and requests that any fee required for timely consideration of this application be charged to Deposit Account No. 19-4972.

If the Examiner finds that there would be patentable subject matter if additional amendments were made, or if the Examiner has any questions as to the allowability of the currently pending claims, or if there are any defects which need to be corrected, the Examiner is invited to speak to the Applicant's counsel at the telephone number given below before issuing a further action.

Respectfully submitted,

June 21, 2006

  
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